Greenhouse Gas Technical Working Group Meeting

Public Working Group Meeting to Discuss the GHG Emissions Inventory the 1990 Emissions Level

February 21, 2007
Sacramento

Workgroup Agenda

- Opening Remarks and Introduction
- Current GHG Inventory
- Potential Areas for GHG Inventory Improvement
  - Staff Discussion
  - Input from Workgroup
- Next Steps

2

Objectives

- Summarize Energy Commission's latest GHG inventory
- Share ARB staff review of selected sectors of the GHG inventory
- Potential areas for improvement
- Solicit ideas for improvements from working group participants

3

I. Introduction

4

California Global Warming Solutions Act of 2006 (AB32)

- Sets in statute mechanisms to reduce greenhouse gas (GHG) emissions
- ARB is the state agency charged with monitoring and regulating sources of GHG emissions

5

AB32 Requirements

- By January 1, 2008, the ARB shall:
  - Determine the 1990 statewide, aggregated GHG emission levels using the best available scientific, technological, and economic information
  - Establish 2020 statewide GHG emissions limit equivalent to the 1990 level
  - Conduct public workshops and provide opportunity for comment during all phases of the process

6

Goals for Developing the GHG Emissions Inventory

- Ensure that inventory is comprehensive and meets current and future program needs
- Establish statewide, aggregate 1990 emissions level and 2020 limit that meets the requirements of AB32

7

2020 Statewide GHG Emissions Limit

- Equivalent to 1990 level
- Based on statewide, aggregate emissions estimate
- Not sector or facility-based
- Non-regulatory

8

II. Current GHG Inventory

9

CEC's Inventory (Released December 2006)

- Published by California Energy Commission (CEC) in December 2006
- Primarily top-down
- Time series 1990-2004
- Anthropogenic GHG emissions/sinks
- CO2, CH4, N2O, High GWP Gases (HFCs, PFCs, SF6)
- http://www.arb.ca.gov/cc/ccei/emsinv/emsinv.htm

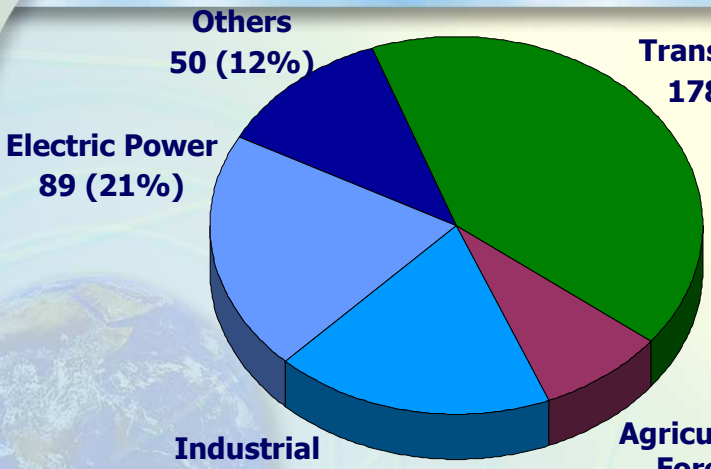
10

Emission Categories

- CEC used emission categories based on:
  - Gas (CO_2, CH_4, N_2O, High-GWPs)
  - Sector (Residential, Commercial, Industrial, Transportation, Electric Power)
  - Fuel (Natural Gas, Petroleum-Diesel, LPG, Gasoline, etc. or Coal)
  - Industry using Standard Industrial Classification (SIC) Codes (i.e., Refineries, Oil & Gas, Power Plants, Landfills, Cement Plants, etc.)

11

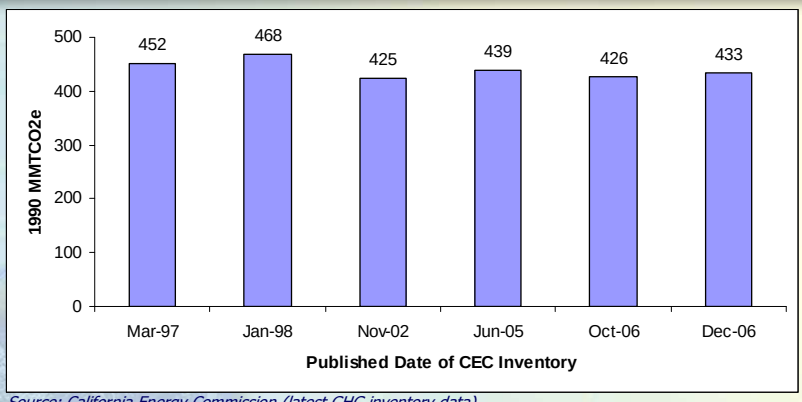
Sources of GHG Emissions in 1990



Source: California Energy Commission; Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004 (latest data)

12

Statewide 1990 Emissions



Source: California Energy Commission (latest GHG inventory data)

- Difference between extreme values is ~10 percent

13

III. Inventory Review & Potential Areas for Improvement

14

Inventory Review Process

- Focus on 1990 inventory emission levels
- Review of guidance from IPCC and U.S.EPA
- Criteria for determining sector/category review
  - Contribution to total emissions
  - Specific concerns on data sources or methods

15

Improving Emissions Estimates

- Sectors/Categories with potential area for improvement in emissions estimates
  - Electric power
  - Transportation
  - Forestry
  - Agriculture
  - Landfills

Five sectors/categories account for approximately 70% of the current total 1990 inventory

16

Electric Power

17

GHG Emissions from Electric Power

- GHG emissions from fuel used to generate electricity
  - Natural gas
  - Petroleum
  - Coal

18

Electric Power Sector GHG Inventory Estimate (In-State)

- Total, in-state electricity generation emissions estimated by CEC: 43.36 MMT CO2 in 1990
  - Natural gas, 36.42 MMT CO2
  - Petroleum, 4.61 MMT CO2
  - Coal, 2.33 MMT CO2

**All data from CEC based on December 2006 revision*

19

Potential Improvement to Electric Power Sector Estimate (In-State)

- Current CEC estimate from petroleum used by utilities for electricity generation: 3.17 MMT CO2 in 1990
  - CEC used an average emission factor to determine 1990 emissions
- Consider facility specific data from Energy Information Administration (EIA) to improve emissions estimate

20

Electric Power Sector GHG Inventory Estimate (Imported)

- Total, imported electricity generation emissions estimated by CEC: 43.31 MMT CO2 in 1990
- CEC includes assumptions on fuel mix and heat content
- "Line Losses" from transmission of electricity not included

21

Potential Improvement to Electric Power Sector Estimate (Imported)

- Improve fuel mix assumptions
- Update fuel energy assumption
- Include "Line Losses" for electricity imports

22

Transportation

23

Transportation Sector

- On-Road – passenger cars, trucks, buses, etc.
- Off-Road – locomotives, aircraft, snowmobiles, construction equipment, etc.
- Fuels generating GHG emissions:
  - Gasoline
  - Diesel
  - Alternative fuels

24

Current CEC Transportation CO2 Inventory Methodology

- Fuel consumption approach
- Gasoline, distillate, aviation, CNG, LPG fuels data were from EIA

25

CEC Transportation CO2 Inventory
(37% of the 1990 statewide GHG emissions)

(MMT CO_2)	**1990**
Gasoline	111
Diesel	18
Domestic Aviation	24
Railroad	2
Statewide Total	155

26

Possible Inventory Approaches for Transportation Sector

- Fuel consumption
- Fuel consumption followed by use of EMFAC/OFFROAD models to allocate emissions by vehicle type
- EMFAC/OFFROAD models

27

Forestry

28

Land Use Change & Forestry Sector Emissions/Sinks

- Emissions/Sinks:
  - 1990 emissions: 5.5 MMTCO2Eq. (CEC)
  - 1990 sinks: 22.7 MMTCO2Eq. (CEC)
- Categories:
  - Forests and Rangelands
  - Woody and non-woody crop ag land
  - Urban greenwaste & lumber landfill disposal
  - Agricultural land limestone application

29

Land Use Change & Forestry Sector Methods

- Methods used by CEC
  - Carbon stock change approach: track gains/losses in biomass
  - Forests, Rangelands (remote sensing)
  - Woody and non-woody croplands (ag census)
  - Urban greenwaste in landfills (sink)
  - CO2 emissions from agricultural soil liming

30

Potential Improvements to Land Use Change & Forestry Sector

- Comparisons with other carbon stock estimates and fire emissions
- Potential other improvements to 1990 inventory for this sector are still under review

31

Agriculture

32

Agriculture Sector GHG Emissions

- GHG emissions from agriculture include:
  - Burning Agricultural Residue
  - Enteric Fermentation
  - Manure Management

33

CEC Agricultural Sector Emission Estimates

- CEC's estimate for agricultural sector in 1990
  - Residue burning: 0.21 MMTCO2eq
  - Enteric fermentation: 7.53 MMTCO2eq
  - Manure management: 4.10 MMTCO2eq

34

Potential Improvements to Agricultural Sector Estimates

- ARB staff looking at ongoing research from other sources
  - State and federal agencies
  - Universities

35

Landfills

36

Current GHG Inventory Estimate for Landfills

- The current 1990 estimate for landfill emissions of fugitive methane is 8.13 MMT CO2 Eq.

37

Potential Improvements to GHG Landfill Estimate

- Landfill gas collection data from landfills statewide
- Create a consistent statewide approach by updating fugitive methane methodologies
- ARB is currently in process of collecting needed data and no revised estimate can be given at this time

38

IV. Next Steps

39

Participant Input/ Role of GHG Inventory TWG

- Sector/category sign-up sheet
- Future meetings
  - Location
  - Frequency

40